MARCORSYSCOM-PS-03-001

PERFORMANCE SPECIFICATION

FOR THE

TRANSITION SWITCH MODULE

Prepared by:

Marine Corps Systems Command

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RECORD OF REVISION

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1.0 SCOPE

1.1 Identification

This specification establishes the technical and functional requirements baseline for the United States Marine Corps Transition Switch Module (TSM). The TSM supports Marine Air-Ground Task Force (MAGTF) command and control communications mission objectives. The TSM provides local and remote subscriber access, circuit switching and multiplexing, a call service attendant, transmission multiplexing, transmission security, and a manual patching capability for deployed Marine forces.

1.2 System Overview

The TSM will provide a flexible unit level switch capability to transition between legacy Tri-Service Tactical (TRI-TAC) switches (SB-3865 and TTC-42) and current commercial technology. The TSM will provide three major functions consisting of the Deployable End Office Suite (DEOS), the Remote Subscriber Access Module (RSAM), and the Deployable Integrated Transport Suite (DITS). The DEOS will provide a basic voice circuit switching, subscriber access and call service attendant capabilities. The RSAM will provide the capability to extend telephone and dial-up data services to remote subscribers. The DITS will be used in conjunction with a DEOS to provide bandwidth management, multiplexing, and technical control functions. Components of the DEOS and DITS will be integrated into transit and storage cases for unit transport.

1.3 Acquisition Strategy

The TSM acquisition will be accomplished using commercial off-the-shelf (COTS) and government-off-the-shelf (GOTS) non-developmental items (NDI). Unmodified COTS and GOTS will be used to the maximum possible extent. The system integrator will be responsible for development of a TSM system operations and maintenance manual, which provides an integrated view of the equipment and interoperation of all components of the TSM system. The system integrator is responsible for system performance, interoperability, and integrity, and will assemble the necessary components to meet the functional and serviceability requirements.

2.0 SPECIFICATIONS, STANDARDS & PUBLICATIONS

2.1 Military Standards - Mandatory

MIL-STD-461E 20 August 1999	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-810F 30 August 2002 Change Notice 2	Environmental Considerations and Laboratory Tests

2.2 Military Standards – Guidance

MIL-STD-1472F 23 August 1999	Human Engineering
MIL-STD-1474D Notice 1 29 August 1997	Noise Limits

2.3 Other Documents – Interface

ICD 002 Chg 4. 2 May 79	TRI-TAC System Orderwire
ICD 003 Chg 5. 15 June 82	TRI-TAC Framing and Synchronization Protocols
DoDD 4650.5 29 March 1999	Positioning and Navigation Systems Administration and Planning
DoDD 5200.28 21 March 1988	Security Requirements for Automated Information Systems (AISs)
CJCSI 6215.01B 23 September 2001	Policy for Department of Defense Voice Networks
ANSI T1.619a-1994	Integrated Services Digital Network (ISDN) Multi-Level Precedence and Preemption (MLPP) Service Capability (MLPP Service Domain and Cause Value Changes). Supplements ANSI T1.619-1992

CJCSI 6212.01B 8 May 2000	Interoperability and Supportability of National Security Systems and Information Technology Systems
CJCSM 6231 December 2002	Manual for Employing Joint Tactical Communications Systems, Vols 1-7
EIA-RS310D September 1992	Racks, Panels and Associated Equipment
FED-STD-595B(1) 11 January 1994	Colors Used in Government Procurement
NFPA 70 2 August 2001	National Electric Code Same as IEEE National Electric Code (NEC) Also see NFPA Res 93 and NECA/IESNA 500
29 CFR 1910 Revision 1 July 2002	Occupational Safety and Health Hazards
ANSI Z136.2 January 1997	American National Standard for Safe Use of Optical Fiber Communications Systems Utilizing Laser Diode and LED Sources
MIL-HDBK-419A 29 December 1987	Grounding, Bonding and Shielding for Electronic Equipments and Facilities
MIL-HDBK-454A 03 November 2000	General Guidelines for Electronic Equipment
MIL-HDBK-783 15 October 1990	Chemical and Biological (CB) Contamination Avoidance and Decontamination
NTISSAM TEMPEST/2-95 12 December 1995	Red/Black Installation Guidance
CALEA January 1999	Commission on Accreditation for Law Enforcement Agencies (CALEA) Standards for Law Enforcement Agencies, 4th Edition
ITU-T Q.400-Q.490 24 July 2002	Specifications of Signaling System R2
ITU-T Q.700 16 May 1994	Introduction to CCITT Signaling System No.7

2.4 Other Government Documents – Guidance

JIEO Report 8249 March 1997 and July 2002 (Draft)	Defense Information Systems Network Circuit Switch Subsystem, Defense Switched Network (DSN) Generic Switching Center Requirements (GSCR)
DSSGR DVX Appendix 2, GSCR May 2003 (Draft)	Deployed Switch System Generic Requirements (DSSGR), Deployable Voice Exchanges / Switch (DVX)
GSTP	Defense Switched Network Generic Switch Test Plan. June 1999 (Base Document) including Annexes (September 2001)

3.0 REQUIREMENTS

3.1 System Definition

The Transition Switch Module (TSM) will provide a deployable circuit switching capability for communications support organizations organic to a MAGTF. The TSM will provide a flexible circuit switching capability that transitions from legacy TRI-TAC switching to current commercial technology. The TSM will provide Marine maneuver elements with more robust voice/data switching, data transport and bandwidth management capabilities.

TSM0001-The TSM shall provide three major functions, a Deployable End Office Suite (DEOS), a Remote Subscriber Access Module (RSAM) and a Deployable Integrated Transport Suite (DITS).

TSM0002-The DEOS shall be a standalone system that provides a basic circuit switching capability, subscriber access, and a call service attendant function.

TSM0003-The RSAM shall provide the capability to extend telephone and dial-up data services to remote subscribers.

TSM0004-The DITS shall provide bandwidth management, multiplexing, and technical control functions.

3.1.1 Mission, Threat, and MAGTF Communications Architecture

3.1.1.1 Mission

The Marine Corps continues to provide multi-mission forces that serve the needs of the Nation. These forces are organized into MAGTFs that are capable of conducting operations across the spectrum of conflict. Additionally, they must be capable of providing complementary capabilities and enabling operations in support of Joint, Combined and Coalition forces. In order to accomplish the assigned mission, the commander of the MAGTF must be capable of communicating with higher, adjacent, and subordinate units. This communications system must be capable of providing transmission paths for voice, video, and data communications.

The system is currently supported by large capacity multi-channel radios and cable systems capable of supporting multiplexed and single-channel circuits. Single-channel radios are used to extend individual circuits to levels within the MAGTF not supported by multi-channel radio systems. These transmission paths tie together tactical telephone switches, message terminals and data switches to insure the MAGTF commander's C2 requirements (intelligence, fire-support coordination, logistics, aviation command and control, manpower and maneuver) are satisfied. The MAGTF commander must be capable of receiving and disseminating information throughout his span of control and between his organization and higher and adjacent headquarters.

At the Major Subordinate Command (MSC) level, the DEOS will augment the circuit switching capability in the Digital Technical Control (DTC) and the Joint Enhanced Core Communications System (JECCS) by providing additional circuit switch subscriber capacity. At the regimental level, the DEOS will provide the primary circuit switching capability. At this level the DITS will provide the interface between subscriber systems/networks within a local area and long-haul multi-channel transmission systems. Additionally, the DITS will be able to add, drop and insert digital circuits into multiplexed digital groups and provide a source of stable timing to connected equipment. At all MAGTF levels, the RSAM will extend and distribute subscriber services. Operational requirements may dictate that the TSM interface to Strategic, Joint or other MAGTF communications assets independent of DTC, TDN or JECCS.

3.1.1.2 Threat

Threats to Marine Corps C2 capabilities, of which the TSM is an integral part, include electronic attack, stand off weapons such as rockets, artillery, and air delivered ordinance, as well as attack by nuclear, biological, and chemical weapons. Specific threats to the TSM will be no greater than those to any other major C2 system in the Marine Corps inventory and therefore will be afforded the same level of physical security and protection. The TSM will have the capability of interfacing with a variety of communications media, both tactical and strategic. To avoid the exploitation of intercepted communications signals, the TSM will employ transmission security (TRANSEC) equipment to provide encryption for multi-channel multiplexed trunks transiting a node that are not within the physically secured perimeter.

3.1.1.3 MAGTF Communications Architecture

The TSM must be designed to operate within the context of the current and planned MAGTF C4I architecture. The following paragraphs provide a high-level overview of these architectures from the perspective of a layered set of capabilities and from a network topology perspective.

3.1.1.3.1 Layered View

As shown in Figure 3.1, the MAGTF C4I communications architecture may be viewed as a set of layered capabilities and systems, with lower layers providing services to higher layers.

The bottom layer consists of those physical transmission systems (multi-channel radio, single channel radio, metallic and fiber optic cable) used to establish communications links among geographically dispersed MAGTF command elements. The multi-channel radio and cable systems are based on digital transmission technology and are designed to carry any form of digital traffic (digitized voice, data, messages, imagery, video). The single-channel radio systems are also digital, but are designed primarily for voice traffic, with a low-speed data capability. Currently fielded Marine Corps transmission systems in this layer include AN/TSC-85C/93C Ground Mobile Forces SHF SATCOM terminals, AN/TSC-152 LMST Tri-Band Satellite Terminals, AN/TSC-154 MILSTAR Satellite Terminals, AN/MRC-142 UHF multi-channel terminals, AN/TRC-170 SHF troposcatter terminals, the Fiber Optic Cable System (AN/GSC-54 modems, MD-1272 Fiber Optic Modems and CX-13295 (TFOCA I) multimode fiber), single

channel UHF SATCOM radios, SINCGARS family of VHF single channel radios, and a variety of other UHF, VHF, and HF single channel radios as well as recently fielded EPLRS network radios.

Directly above this layer are those systems used to manage these long-haul transmission links and interconnect them with local command post circuits from either subscriber equipment or switching systems. This layer multiplexes individual circuits, trunks, and groups into transmission links. It has the capabilities required to add, drop and insert digital circuits into multiplexed digital groups; provide a source of stable timing (Plesiochronous/Independent Nodal Timing/Stratum 1) to connected equipment; condition analog circuits; and perform analog to digital, 2-wire to 4-wire, and signaling conversions. It also contains the monitoring, testing and patching equipment required by technical controllers to monitor, troubleshoot and restore faulty circuits and trunks. Currently fielded Marine Corps systems in this layer include the DTC facility, the JECCS and multiplexers organic to existing multi-channel transmission systems. The AN/PTW-1 augments the DTC's analog capabilities. The TSM Deployable Integrated Transport Suite (DITS) augments/enhances the DTC/JECCS and provides a robust capability to dynamically manage digital transmission links, trunks and circuits as described above.

At the next layer up are the systems that switch voice, video and data traffic. These switching systems are designed to efficiently interconnect subscriber equipment within a command post to other subscriber equipment within the same command post or at distant locations. The Unit Level Circuit Switch (ULCS) family of equipment is currently used to switch digitized voice traffic and to provide low data rate (16 kbps or 32 kbps) circuit switched data connections.

The major ULCS components are the AN/TTC-42, a 280-line automatic telephone central office and the SB-3865, a 30-line automatic switchboard. The analog SB-3614 switchboard is also used to augment the ULCS switches where required. The CGS-300 is currently used to receive and disseminate record traffic messages. CGS-300 is designed to interoperate with AUTODIN switching centers and other Services' AN/TYC-39 tactical message switches. It will be phased out along with AUTODIN as the new Defense Message System (DMS) is fielded.

The Tactical Data Network (TDN) system provides a robust data packet switching capability. TDN Gateway and Data Distribution System (DDS) nodes will be interconnected with one another via the transmission systems described above to form an internetwork of Ethernet WANs/LANs and EPLRS radio data networks connected to one another and to strategic networks such as NIPRNET and SIPRNET. This internetwork will allow attached subscriber equipment to exchange IP datagrams with other subscriber equipment worldwide. In addition, TDN Gateways and DDSs will host a DMS-compliant message transfer and directory system for the exchange of record traffic and unofficial electronic mail. The DMS capability replaces the record traffic system based on AUTODIN and tactical message terminals/switches such as the CGS-300 and TYC-39. Although the TDN has a stand alone capability, the TDN will normally be deployed with the DTC and will primarily utilize the DTC as its access to communications systems among the DTC deployments and other users.

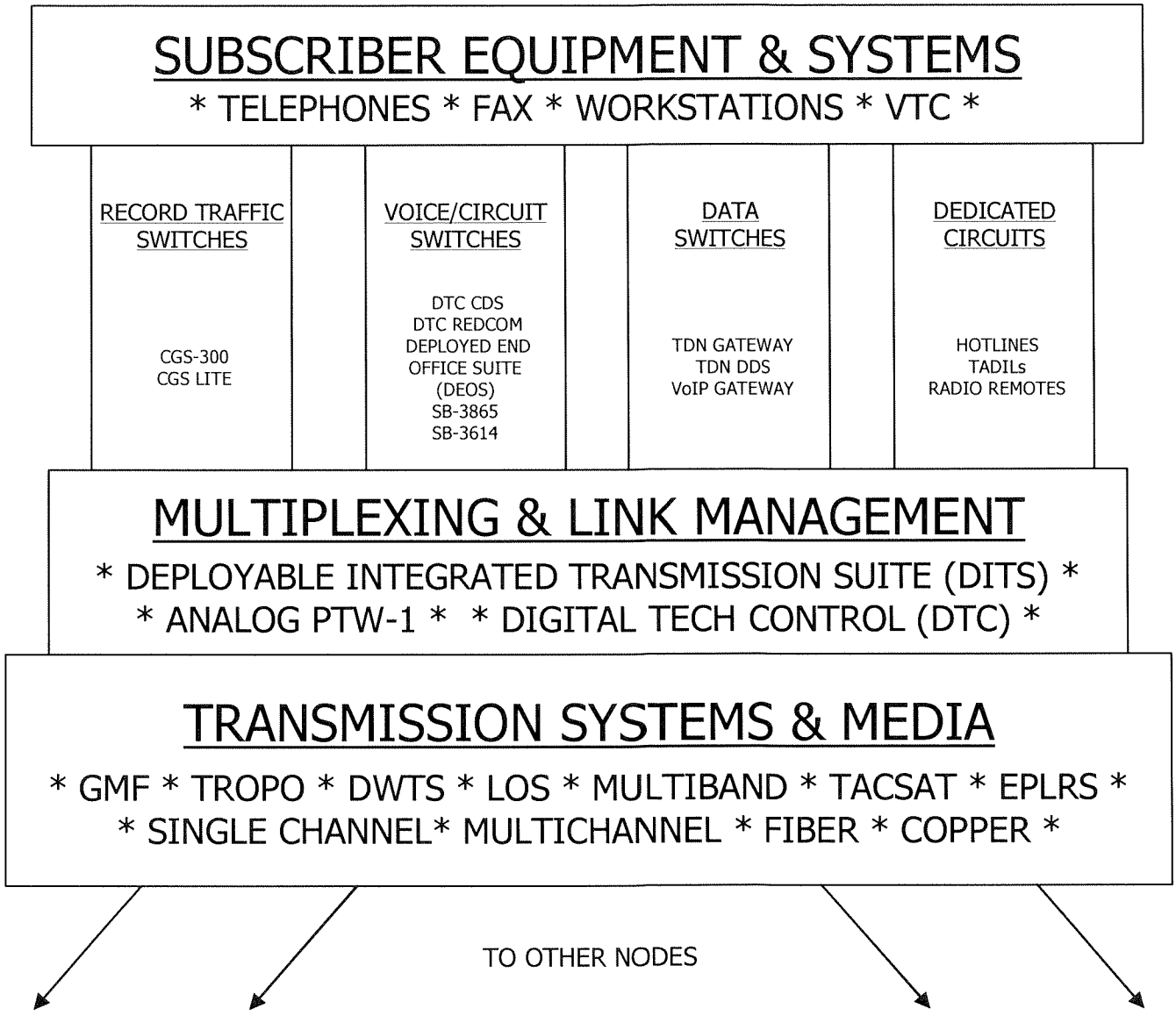

Figure 3.1 Communications Node

3.1.1.3.2 Network Topology

The following two sections describe the current (2003) and planned (2006-2016) MAGTF C4I communications architecture from a digital network topology perspective. As depicted in Figures 3.2 and 3.4, both the current and planned architectures have several key features in common:

a. Connectivity among nodes is primarily hierarchical, from the strategic networks down to individual Battalions and Squadrons, reflecting the Joint Task Force (JTF) and MAGTF chain of command. Lateral links are installed whenever practical to improve traffic flow, avoid bottlenecks, and enhance overall network reliability and survivability. In general, the sizing of communications links will be to interconnect a MEF DTC, a Wing DTC, a Tactical Air Command Center (TACC) DTC, a Force Service Support Group (FSSG) DTC, and a Division (DIV) DTC. Each deployment will require a single DTC system except at the MEF, when acting as the JTF, where two DTCs may be required. A third MEF DTC either collocated or remote may be deployed if necessary.

b. Links from a deployed JTF and MAGTF to the Defense Information Systems Network (DISN) are normally provided by satellite communications. Currently, these links are predominantly SHF (X-band) military SATCOM using Ground Mobile Forces (GMF) terminals. In the future, more C-band and Ku-band commercial SATCOM will be employed, using mobile Tri-Band (X, C, Ku) SATCOM terminals. The limited capacity of these links to DISN has always been and is expected to remain a significant choke point for deployed MAGTFs. More efficient use of these links is critical to achieving higher effective traffic throughput by automatic/dynamic bandwidth management.

c. Links between the JTF Headquarters, Service Component Headquarters, MEF Command Element, and Major Subordinate Commands (MSCs) are predominantly provided by GMF SATCOM, supplemented where practical with terrestrial line-of-sight (LOS) and troposcatter multi-channel radio systems.

d. Links between and among MSCs and their immediately subordinate units are predominately terrestrial line-of-sight and troposcatter multi-channel radio systems as well as newly fielded MILSTAR satellite systems.

e. The digital switch/multiplexer equipment, which provides access to the digital backbone network at the Regimental/Group level, is currently the ULCS SB-3865 and TD-1234 remote multiplexer combiner. Although providing digital connectivity, this equipment limits user circuit speeds to 16 kbps or 32 kbps. The addition of the AN/FCC-100 (LRDM) has improved the data rates of these links on both the aggregate and port sides, but requires manual interaction to manage these bandwidth increases.

f. The digital communications backbone of multi-channel radio links stops at the Regimental/Group level, with just a few exceptions. These exceptions are primarily in the Aviation Combat Element where multi-channel links interconnect most Marine Air

Command and Control Agencies and airfields hosting Air Groups and their Squadrons. Communication below the Regimental/Group level depends mostly on single channel radio for voice traffic and EPLRS radio networks for low speed (56Kbps) data traffic.

3.1.1.3.3 Current Digital Backbone

Transmission links supporting the current digital backbone include TSC-85B/93B GMF SATCOM terminals, TSC-152 Tri-Band terminals, TSC-154 SMART-T terminals, TRC-170 troposcatter and MRC-142 line-of-sight multi-channel radio terminals, and the Fiber Optic Cable System. As depicted in Figures 3.2 and 3.3, the digital nodal equipment capable of terminating communication links provided by these systems are the DTC, TTC-42, SB-3865, TD-1234 and FCC-100. The SB-3865s and FCC-100s at Regiment and Group headquarters serve as both end-office voice switches and limited technical control facilities. This current arrangement limits the ability of (lower hierarchy) units to isolate and restore faulty circuits, patch circuits among different trunk groups, and dynamically manage bandwidth on transmission links. It also limits voice user access to the digital backbone to either 16 kbps or 32 kbps. These speeds are adequate for voice circuits but are limited in the use of Plain Old Telephone Service (POTS) instruments and STE/STU secure voice devices on the modern battlefield.

3.1.1.3.4 Planned Digital Backbone

Current transmission links will continue to support the planned digital backbone. As shown in Figures 3.2 and 3.4, the Digital Technical Control (DTC) facility will be augmented by the TSM (both DEOS and DITS) in it's role as a tandem switch and a technical control facility at all levels within the Major Subordinate Commands (MSCs); MEF, Wing, Division, and FSSG. The TSM will eliminate current limitations by providing sole-user circuit connectivity; a robust capability to monitor, troubleshoot and restore faulty circuits and trunks; the capability to dynamically manage link bandwidth utilization; the ability to multiplex and demultiplex circuits; and rearrange digital transmission groups. It will also terminate user access circuits upon deployment and critical user circuits operating at rates in excess of 32 kbps, up to the limits of the connected multi-channel transmission systems. By functioning as an end office switch, the TSM will replace the TTC-42, allowing more subscribers to be more efficiently supported. It must be noted that the SB-3865 is expected to remain in the nodal equipment inventory for secure voice interoperability with U.S. Army Mobile Subscriber Equipment (MSE) at Regimental/Group levels.

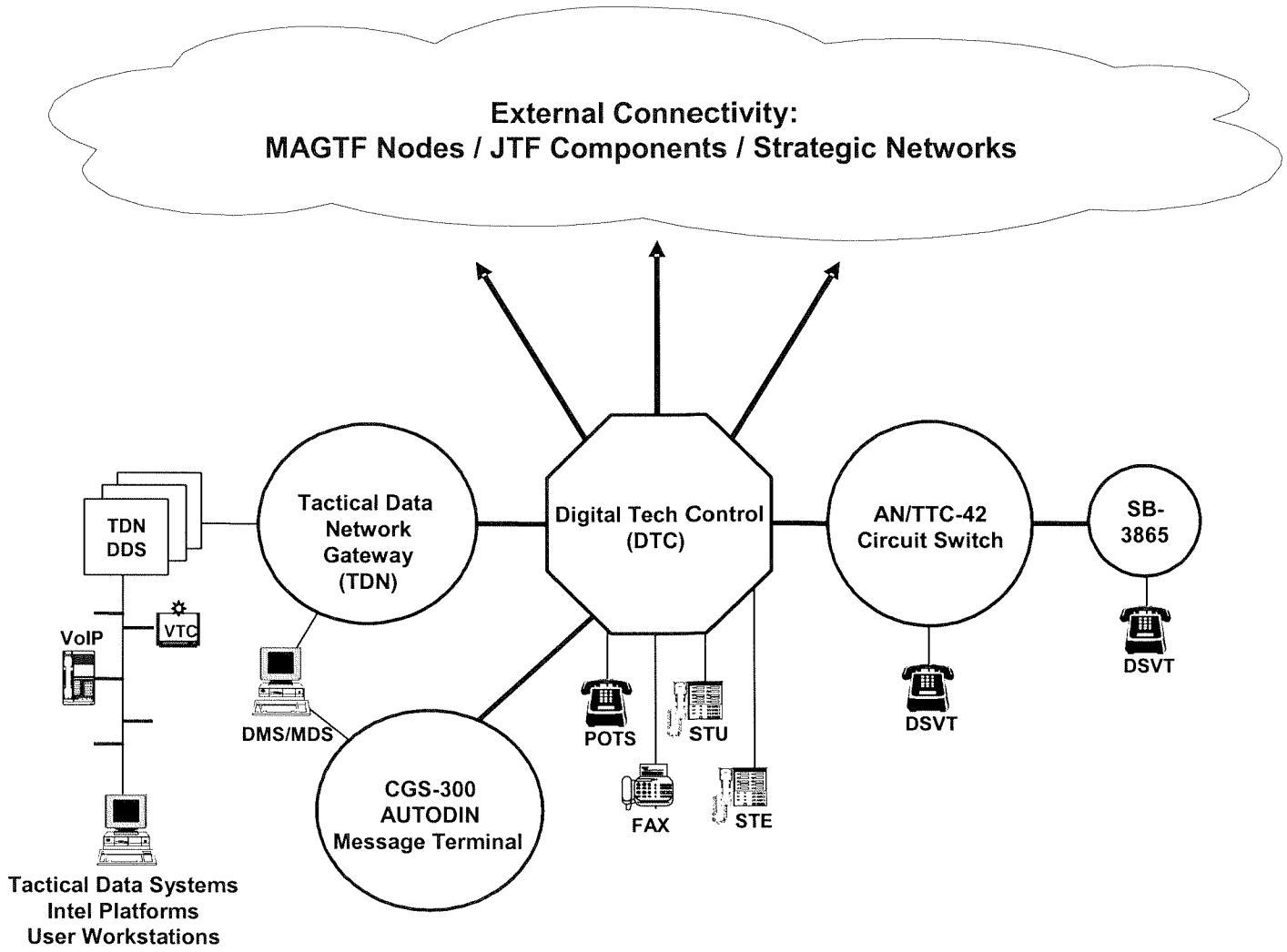

Figure 3.2 Current MEF CE Node

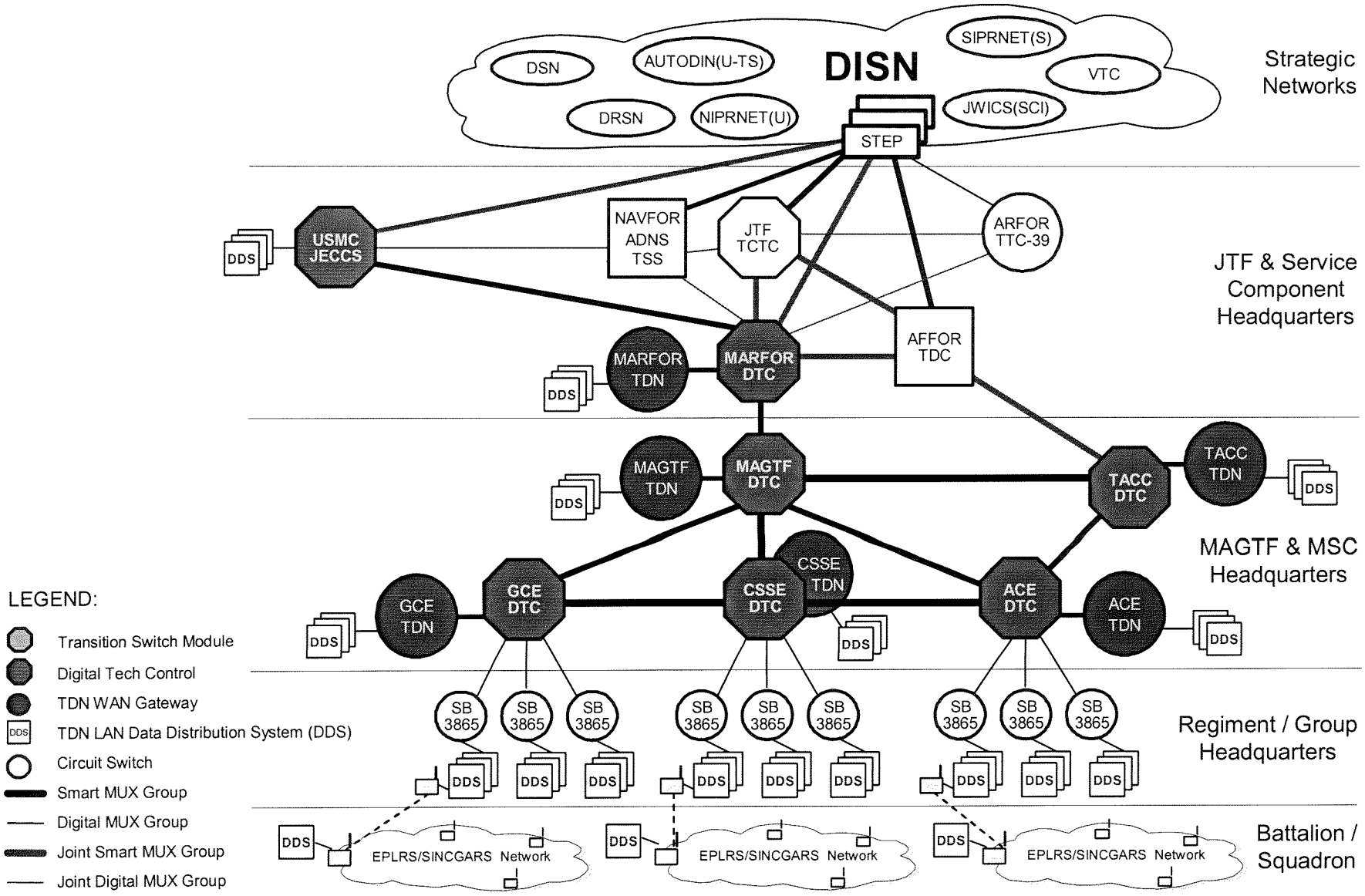

Figure 3.3 Current Digital Backbone

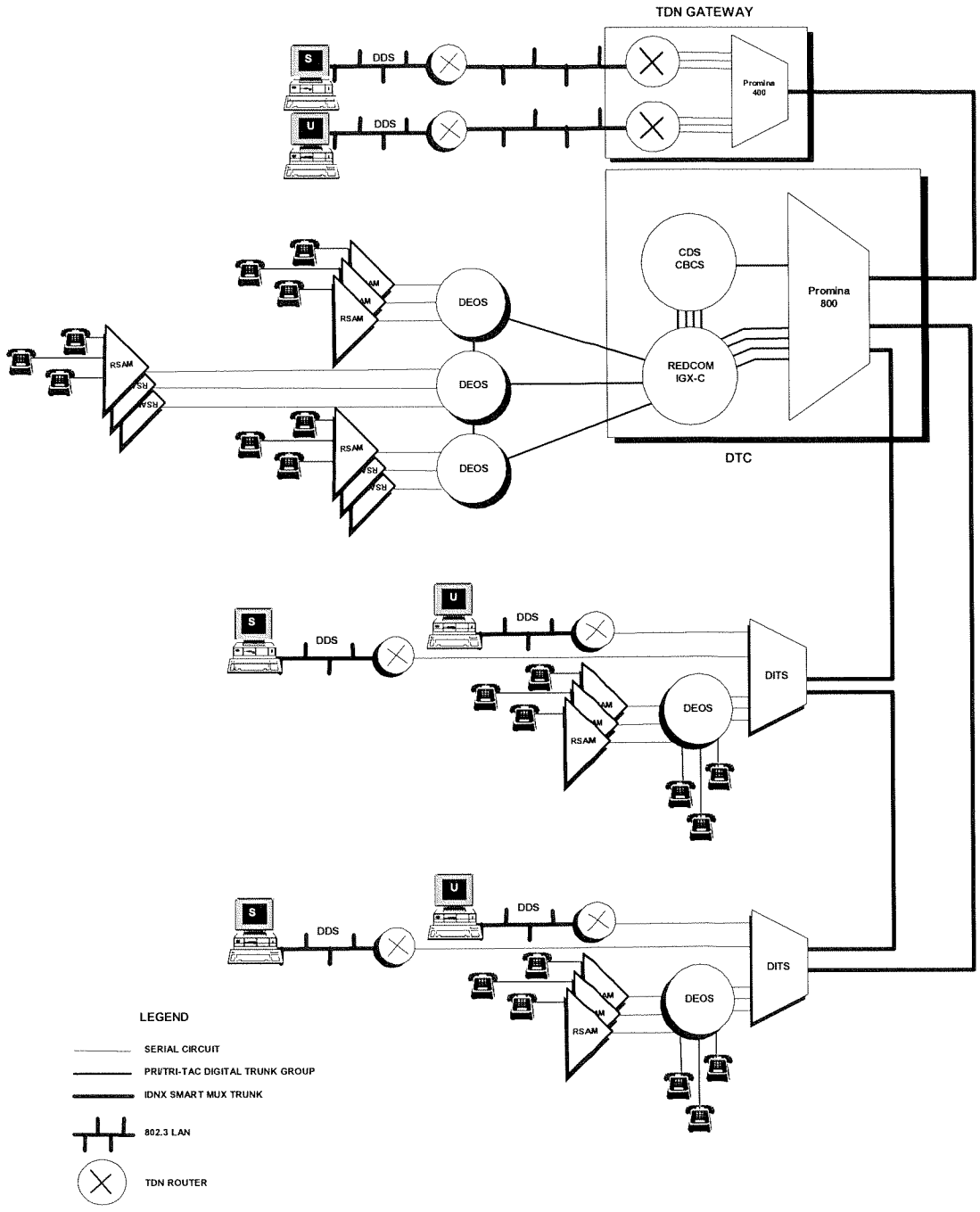

Figure 3.4 Planned MEF CE Node

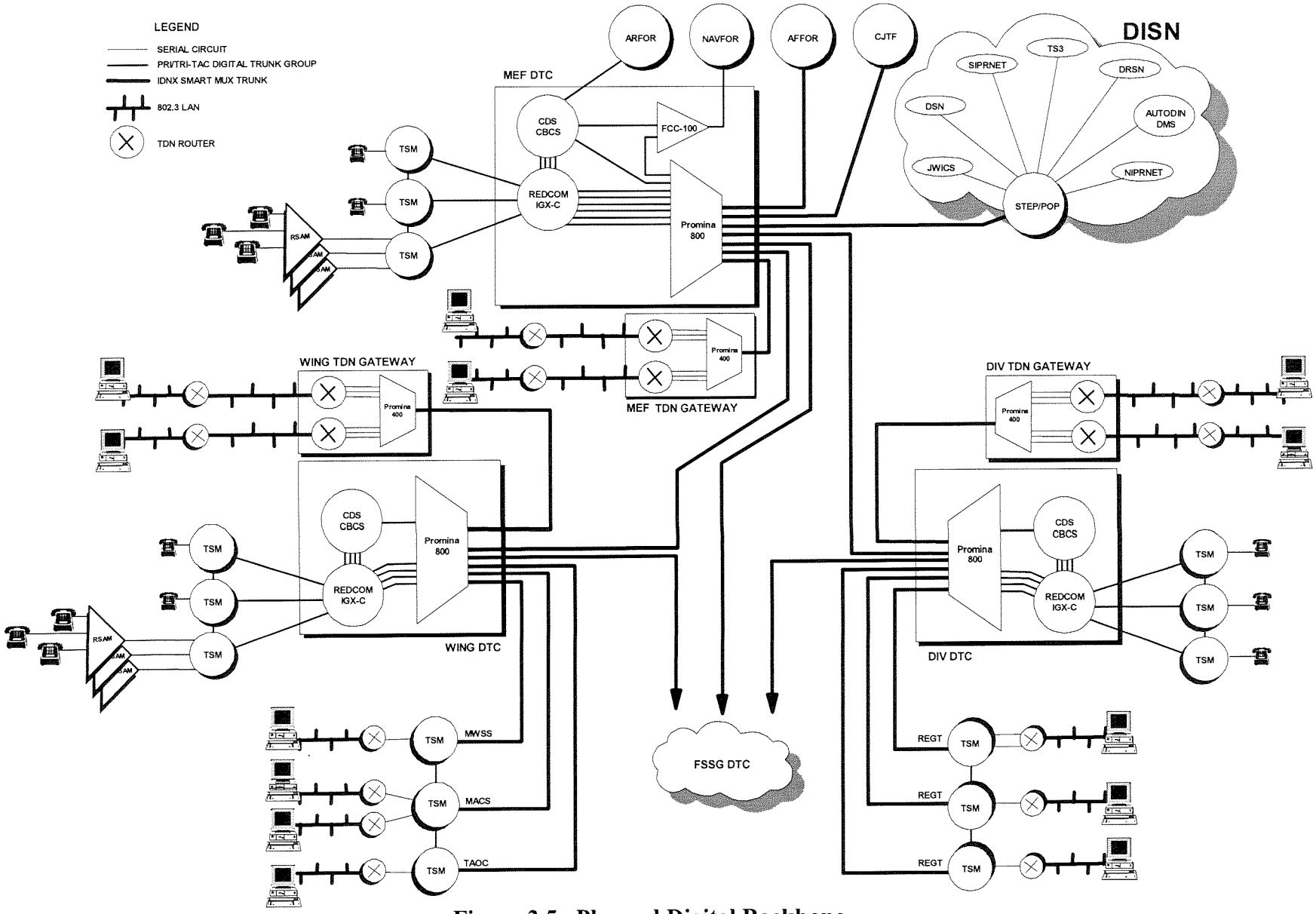

Figure 3.5. Planned Digital Backbone

3.1.2 Interoperability

The following paragraphs identify the TSM mission-essential interface and connectivity requirements by DEOS and DITS functions.

3.1.2.1 DEOS and DITS Interfaces

TSM0005-The DEOS, RSAM, and DITS shall be electrically and physically interoperable with the following equipment, systems, and networks. This list identifies the DEOS, RSAM, and DITS threshold (T) and objective (O) interfaces.

Interface	DEOS	RSAM	DITS
Digital Secure Voice Terminal (KY-68)	T		T
Secure Terminal Unit (STU-III)	T	T	T
Secure Telephone Equipment (STE) – STU-III Mode	T	T	T
Secure Telephone Equipment (STE) – FNBDT Mode	T	T	T
Secure Telephone Equipment (STE) – ISDN Mode	T	T	
Tactical Telephone (TA-838) – 2-wire CB Mode	T	T	T
Blackjack Secure Digital Facsimile (UXC-10)	T	T	
Automatic Telephone Switchboard (SB-3865)	T		T
Automatic Telephone Switchboard (SB-3614)	T		
Troposcatter Radio Set (AN/TRC-170)			T
Digital Wideband Transmission System (AN/MRC-142)		T	T
Satellite Communications Terminal (AN/TSC-85C)			T
Satellite Communications Terminal (AN/TSC-93C)			T
Tri-Band Satellite Terminal (AN/TSC-152 LMST)			T
SMART-T MILSTAR Satellite Terminal (AN/TSC-154)			T
AN/PSC-2/3/5 Single Channel UHF Radio	T		
Fiber Optics Converter Set (AN/GSC-54)			T
Fiber Optic Modem MD-1272			T
AN/TSQ-227 Digital Technical Control (DTC)	T	T	T
AN/TSQ-231 Joint Enhanced Core Comm System	T	T	T
AN/TSQ-222 Tactical Data Network (TDN) Gateway	T		T
AN/TSQ-228(V) Data Distribution System (DDS)	T		T
Other DEOS	T	T	T
Other DITS	T	T	T
Other RSAM	T		T
DISN Defense Switched Network (DSN)	T		T
DISN Defense Video Services (DVS)	T	T	T
DISN Promina Network			T
Public Switched Telephone Network (PSTN)	T	T	T
DISN SIPRNET			T
DISN NIPRNET	O		T

3.1.2.2 DEOS and DITS Connectivity

TSM0006-The DEOS and DITS support connectivity with several equipment and systems. The DEOS and DITS shall provide for the connectivity shown in Figure 3.6. This figure provides a reference of the DEOS and DITS connectivity by interface to a piece of equipment or system. This figure is not intended to show requirements for simultaneous connectivity nor the quantity of interfaces required.

3.1.3 TSM System Functions

TSM0007-The TSM shall be a modular system. It will consist of three major functions, a Deployable End Office Suite (DEOS), a Remote Subscriber Access Module (RSAM) and a Deployable Integrated Transport Suite (DITS). The DEOS and DITS can be deployed independently. A typical MSC level TSM configuration will consist of a DEOS and RSAMs. They will be employed in conjunction with existing circuit switch assets, such as the REDCOM IGX-C in the AN/TSQ-227 Digital Technical Control (DTC) and the AN/TSQ-231 Joint Enhanced Core Communication System (JECCS). It will also utilize bandwidth management/multiplexing capabilities (Promina 800) resident within the DTC. A typical Regimental/Group level TSM will consist of a DEOS, RSAMs and a DITS. At this level, the DEOS will provide the circuit switching function. The RSAM will provide extension and distribution of subscriber services. The DITS will provide the bandwidth management and control functions. The DITS functions are necessary for connecting the DEOS to lateral, upper or lower echelons via a variety of transmission systems.

TSM0008-The TSM shall provide cryptographic protection of data using bulk encryption devices and end-to-end protection of voice or data by using user-provided encryption devices, STEs, DSVTs or STU-IIIs. The use and configuration of cryptographic devices will be in accordance with Department of Defense (DOD) Directive 5200.28. The TSM employs cryptological devices for traffic-flow security. The circuit switching function relies on the user-provided secure instruments for end-to-end security. The TSM DITS provides traffic-flow security when necessary.

TSM0009-TSM shall include the ancillary cabling/equipment necessary to safely and efficiently interconnect DEOS, DITS and RSAM external interfaces (TSM0037, TSM0038, TSM0044, TSM0067, and TSM0068) with legacy USMC cable plant (CX-4566, CX-11230, CX-13295, CAT-5, WF-16 and WD-1).

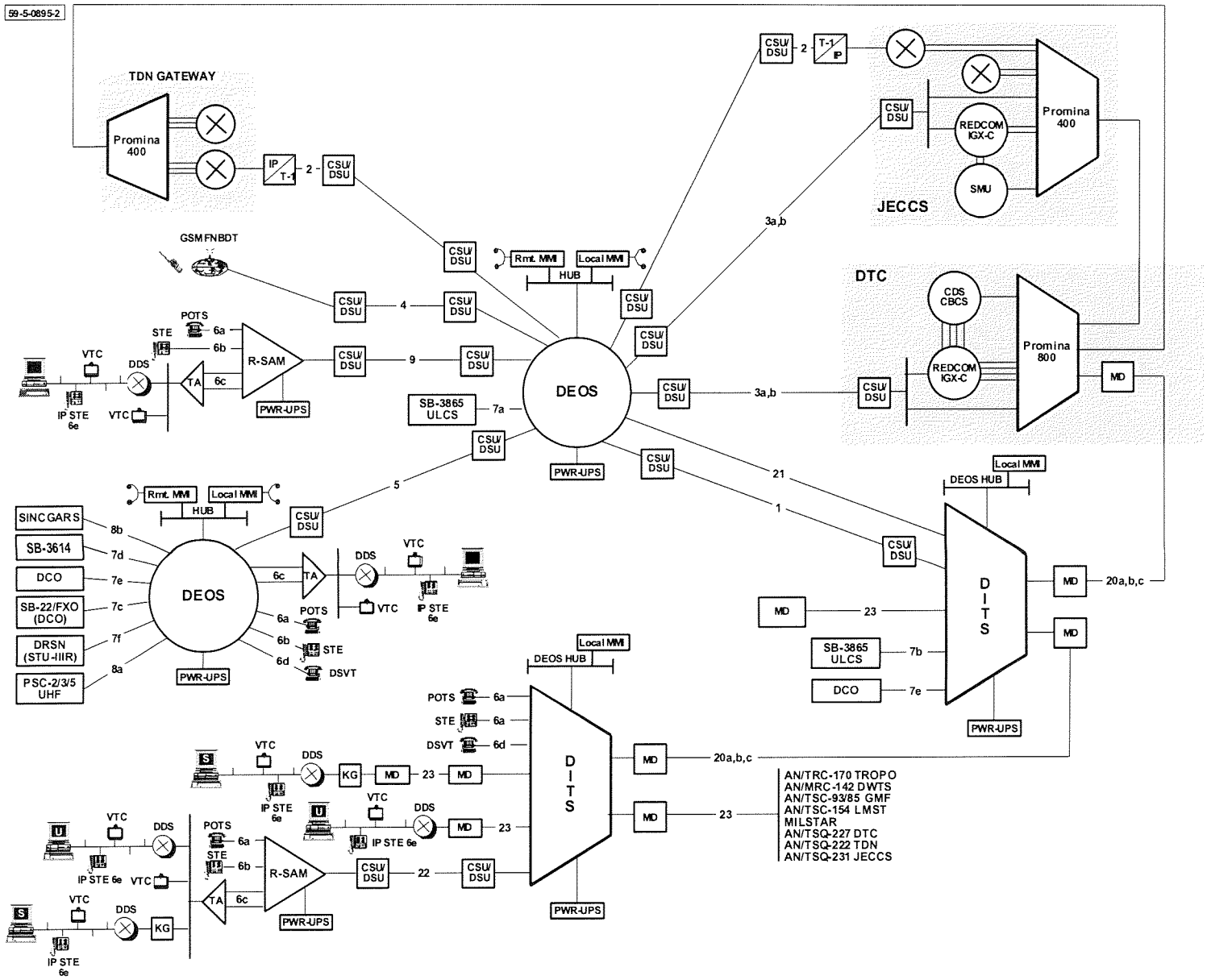

Figure 3.6 DEOS and DITS Connectivity Options

Notes to Figure 3.6 – DEOS and DITS Connectivity Options:

DEOS:

1. DITS, T1/FT1/PRI/FPRI
2. T1/IP (converts T1 to IP)
3. DTC:
   a. REDCOM IGX, T1/FT1/PRI/FPRI
   b. Promina 800, T1/FT1/PRI/FPRI
4. GSM FNBDT, T1/FT1/PRI/FPRI
5. DEOS, T1/FT1/PRI/FPRI
6. Subscriber:
   a. POTS, 2-wire (e.g., STU-III, STE, etc.)
   b. STE, BRI (ISDN mode)
   c. Terminal Adapter, BRI (e.g., VTC and SECRET/UNCLAS Data)
   d. DSVT, 4-wire CDI balanced
   e. STE, IP
7. Special:
   a. SB-3865, 4-wire analog IST
   b. SB-3865 CDI
   c. SB-22/FSXO, 2-wire LS/GS
   d. SB-3614, 4-wire analog IST
   e. DCO, 2-wire FXO
8. Radio Wire-line Interface:
   a. UHF SATCOM, e.g., PSC-2/3/5
   b. SINCGARS
9. RSAM, T1/FT1/PRI/FPRI

DITS:

Subscriber: 6a, 6b, and 6d (see DEOS interface)
Special: 7b and 7e (see DEOS interface)
20. Modem:
   a. DTC or DITS, CDI unbalanced
   b. DTC or DITS, fiber
   c. DTC or DITS, CSU/DSU
1 and 21. DEOS, T1/FT1/PRI/FPRI (w/o CSU/DSU)
22. RSAM, T1/FT1/PRI/FPRI
23. General Purpose modem (compatible interface)

RSAM:

Subscriber: 6a, 6b, and 6c (See DEOS interfaces)
9. DEOS, T1/FT1/PRI/FPRI
22. DITS, T1/FT1/PRI/FPRI

3.1.3.1 DEOS

TSM0010-The DEOS shall provide a circuit switching function.

TSM0011-The circuit switch and other major equipment shall be integrated into transit cases. The following communication functions and equipment will be provided for each DEOS.

3.1.3.1.1 Circuit Switching Function

TSM0012-The circuit switch (CS) shall be based upon and supported by Integrated Services Digital Network (ISDN) technology. The circuit switch shall be modular in implementation and capable of supporting the subscriber and transmission interfaces shown in paragraph 3.1.2.

a. **TSM0013**-Physical Characteristics. The CS equipment shall be mounted in standard 19" racks. The commercial circuit switch equipment shall be modular in design and capable of being expanded by adding modules or DEOS.

   TSM0014-Switch Architecture. The CS shall allow stacking of a minimum of three DEOS to form a single, larger, non-blocking, integrated circuit switch. When stacked, the number of trunks and loops provided shall be equal to three times those provided in a single configuration.

b. **TSM0015**-Traffic Metering. The CS shall be capable of generating traffic data, peg count and usage of trunks, lines, and common equipment, as calls are processed.

   TSM0016-This data shall be accumulated over administrator-specified amounts of time and be accessible to switch administrators.

c. **TSM0017**-Software. Each CS database and operating system shall be stored in nonvolatile memory in the CS and not be lost with normal shutdown or with unexpected loss of power. The CS shall provide SNMP MIB agents or have Neuralstar 6.2 adapters (proxies) available to allow Joint Network Management System (JNMS) monitoring.

   TSM0018-The switch shall provide CS operational database to a removable storage device.

   TSM0019–The switch software shall be capable of being upgraded/patched at the owning unit by the DEOS operator.

3.1.3.1.1.1 Circuit Switch Interfaces

3.1.3.1.1.1.1 Circuit Switch Standard Interfaces

TSM0020-Line cards shall be installed in the circuit switch to support the following minimum

standard subscriber requirements:

a. Eighty Eight (88) two-wire POTS telephones

b. Eight (8) ISDN Basic Rate - S Interfaces

c. Six (6) Digital Trunk Interfaces (T). Eight (8) Digital Trunk Interfaces (O). Each of these interfaces shall be capable of being software configurable as either a DS-1 or E-1, support Channel Associated Signaling (MF) and ISDN PRI (IAW the GSCR and ANSI 619a), and a combination of both CAS and ISDN PRI within a single digital trunk. A minimum of three Digital Trunk Interfaces shall provide connectivity to the DITS or to other DEOS. A minimum of three Digital Trunk Interfaces shall provide connectivity to the RSAMs. Digital Trunk Interfaces provided in excess of the threshold shall be configurable by the operator to provide connectivity to the DITS/DEOS, to the RSAMs or to meet the objective requirements of TSM0072/TSM0073. These physical interfaces may be integral to the CS, extended via an adapter cable, or may appear on the DEOS Signal Entry Panel provided that they are readily accessible by the operator.

3.1.3.1.1.1.2 Commercial Circuit Switch Configuration Interfaces

TSM0021-Configuration line cards shall be provided as part of a configuration kit to support the following interfaces:

a. Four (4) Half-duplex Radio-Wire Interfaces capable of both PTT and VOX keying.

b. Four (4) 2-wire loop-start and ground-start trunks

c. Four (4) 4-wire analog trunks (SF, AC Supervision, Type 34 and Type 36)

d. Four (4) 4-wire balanced conditioned diphase loops

e. Four (4) ISDN Basic Rate – U Interface

TSM0022-A hard-sided carrying case shall be provided for protection and transport of the configuration cards.

3.1.3.1.1.1.3 Circuit Switch Features

TSM0023-The CS shall provide the following features at a minimum:

a. Call forward

b. Call Hold, Park, and Pick-up

c. Non-secure conferencing allowed at a minimum of two (2) simultaneous five-party conferences. Conference calls shall allow Preset, Meet-Me, and Progressive set up.

d. Abbreviated dialing

e. Compressed or speed dialing

f. Hot Line/Warm Line. It shall be possible for instruments to place calls by simply going off-hook. This shall be configurable to immediately place a call upon recognition of an off-hook (Hot Line) or to wait a defined number of seconds after recognition of an off-hook before placing a call (Warm Line). During the wait period of a Warm Line, it shall be possible to dial as normal.

g. Station Hunting. Hunt groups can be defined, each with a minimum of 5 members

h. Precedence and Preemption. The CS shall be capable of tandeming multilevel precedence and preemption (MLPP) signaling between switches that it interconnects or traverses.

i. Support for legacy conditioned diphase secure telephones. The CS is not required to provide a COMSEC parent capability.

j. International signaling. The CS shall provide interoperability with NATO forces and host nation infrastructure to include at a minimum E1/R2 (IAW ITU-T Q.400-Q.490 Specifications of Signaling System R2).

k. (O) Signaling System 7 (SS7) capability/connectivity (IAW ITU-T Q.700, Introduction to CCITT Signaling System No.7).

l. (O) Commission on Accreditation for Law Enforcement Agencies (CALEA) compliance in accordance with Standards for Law Enforcement Agencies, 4th Edition.

3.1.3.1.1.1.4 Routing and Numbering Plan

TSM0024-The routing and numbering plan shall meet the standard commercial telephone network criteria, the DSN Worldwide Routing and Numbering Plan, and the Global Block Numbering Plan (GBNP) as detailed in CJCSM 6231 Vol 2.

a. Alternate routing for busy or blocked trunks shall be provided.

b. A 3/4 and 4/3 numbering plan shall be accommodated.

3.1.3.1.1.1.5 Commercial Circuit Switch Management and Administration

TSM0025-The circuit switch shall provide a configuration capability to allow an operator to locally and remotely configure and/or control the switch. Remote configuration shall include access via IP network and dedicated dial-up modem access. Dedicated communication channels

and dial-up capability shall be provided to support switch management access. Dial-up modem port connection shall not be additive to the port requirement in TSM0020.

TSM0026-Local & Remote Administration – Two administration workstations shall be provided. The administration workstations shall support operator management of the local circuit switches as well as the Call Service Attendant capability. Local and Remote Administration workstations shall be selected from the current USMC Marine Corps Common Hardware Suite of equipment. At a minimum each workstation shall be configured with the following software versions (or later): Microsoft Windows 2000 and Microsoft Office 2000 (GFM). Additionally, the administration workstations shall be capable of running the TSM Electronic Technical Manual(s).

TSM0027-A minimum of one Ethernet hub shall be provided to allow for local and remote access. The Ethernet hub shall provide sufficient numbers and types of ports to interface with the DITS Administration workstation, the DITS TRC, the circuit switch, and the DEOS Administration workstations.

TSM0028-The circuit switch shall include an administrative function that enables an operator to assign time slots for subscribers and trunks, assign subscribers to groups, and control conferencing. The administrative functions shall permit establishing dial codes, establishing class of service for subscribers, groups and trunks, setting trunk group priorities, setting subscriber interface characteristics, assigning members to trunks, defining trunk signaling protocols, and setting circuit switch internal timing and optional features.

TSM0029-The Circuit Switch Administration function shall support a command line (Threshold) or Graphical user interface (Objective). The Administration Function shall include:

a. Multiple user access levels

b. Templates for common tasks (i.e., assigning a telephone or building a trunk group).

c. Scripting utility that will allow routine or repetitive tasks to be automated.

d. Provide access to the Circuit Switch file system for manipulation of stored databases.

e. On-line help.

f. Database error checking.

TSM0030-The administrative functions for the circuit switch shall be capable of being controlled, at a minimum, by two serial interfaces and one TCP/IP (Ethernet) interface. The switch shall provide an access control capability (e.g. passwords, levels of access) to provide security for the TCP/IP interface.

3.1.3.1.1.1.6 Circuit Switch Certifications

TSM0031-The CS shall be certified as jointly interoperable (Joint Interoperability Test Center - JITC certification) in accordance with CJCSI 6212.01B. Specifically, the TSM shall be certified as a tactical switching system and tested in accordance with the interoperability requirements in TSM PS paragraph 3.1.2. The TSM shall also be certified to connect directly to the Defense Switch Network as a tactical gateway switch providing tandem MLPP service to and from the USMC tactical voice network. This capability shall include, at a minimum, connectivity via a STEP, DISA Teleport, DISA Service Delivery Node and Commercial Teleport.

It is the Government's intent that the CS comply with the criteria for operation as a Deployed Voice Exchange (DVX) IAW the DSSGR as referenced in the 2002 GSCR, upon finalization and signature of these documents by the appropriate authority.

3.1.3.1.2 Remote Call Service Attendant

TSM0032-The circuit switch shall incorporate a remote call service attendant capability that can simultaneously support a minimum of two attendants. This capability shall be resident on the two DEOS administration workstations.

TSM0033-The call service attendant shall be capable of being remoted from the CS via a TCP/IP interface.

TSM0034-The call service attendant shall provide the following features:

a. Call handling and distribution
b. Allow the operator to talk and listen to both parties requiring service from the call service attendant position
c. Call Queuing based on Precedence. Operator shall have the ability to review calls in queue by station number and precedence, and be able to answer calls in any order
d. Call Hold, Call Split, and Call Transfer
e. Directory Assistance
f. Activate conferences
g. Provide an access control capability (e.g. passwords, levels of access) to provide security for the TCP/IP interface

3.1.3.1.3 ISDN Terminal Adapters

TSM0035-Two ISDN Terminal Adapters (TA) shall be provided with each DEOS. The ISDN TAs shall support North American switch type support for S/T versions including AT&T 5ESS, Northern Telecom, DMS100, National ISDN-1, and NEC. The TAs shall support synchronous data transfer up to 384 Kbps. The TAs shall provide EIA-530 and RS-366 dialing port interfaces for connectivity to a router or VTC. One EIA-530 interface cable (8') and one RS-366 cable (8') shall be provided with each TA.

3.1.3.1.4 Channel Service Unit (CSU)/Digital Service Unit (DSU)

TSM0036-Three (3) CSU/DSUs (threshold), five (5) CSU/DSUs (objective) shall be rack mounted and three (3) CSU/DSUs (threshold), five (5) CSU/DSUs (objective) shall be provided in a stand-alone configuration. Each CSU/DSU shall operate, at a minimum, at the following rates: 256, 512, 768, 1344, and 1536 kbps. Each CSU/DSU shall provide a standard T1, 1.544 Mbps, HDSL network interface. The CSU/DSUs will be used to provide connectivity to senior/peer systems via the T1 Digital Trunk interfaces. CSU/DSUs in excess of the threshold will be used to meet connectivity requirements for TSM0072 and TSM0073. For the rack mounted CSU/DSUs, the physical interfaces may be integral to the CSU/DSU, extended via an adapter cable, or may appear on the DEOS Signal Entry Panel provided that they are readily accessible by the operator.

The CSU/DSU shall support the following timing capabilities:

a. Port: reference timing to DTE Terminal Timing
b. Network: reference timing to Receive Timing
c. Internal: reference timing to an internal oscillator
d. External: reference timing to an external Clock Input

3.1.3.1.5 DEOS Signal/Power Entry Panel

TSM0037-Lightning and EMP protection shall be provided on all SEP interfaces. The SEP shall provide a ground terminal lug. Signal cable shields, e.g., CX-11230, shall be connected internally to the SEP ground terminal lug. Each interface on the SEP shall be identified with metal labels that are secured with rivets.

TSM0038-The DEOS shall contain a signal entry panel that shall provide appearances for the following:

a. Administration and control interface(s) via serial and Ethernet connections.

b. Local subscriber access for analog and digital subscribers. Subscribers required by TSM0020 and TSM0021 shall be able to connect to the DEOS via a contractor furnished cable distribution system using lightning protected (per paragraph 3.2.7.11), single or multi-port breakout adapters or distribution boxes.

c. External timing /clock interface.

d. Stacking/bus termination connectors (as required).

e. Power.

3.1.3.1.6 DEOS Uninterruptible Power Supply

TSM0039-The DEOS shall be provided with a separate Uninterruptible Power Supply. It will be separate from the DEOS in order reduce or minimize weight of the DEOS. The UPS shall

provide a minimum of 15 minutes (threshold)/30 minutes (objective) of reserve power to all major components of the DEOS.

3.1.3.2 Remote Subscriber Access Module (RSAM)

TSM0040-The RSAM shall provide the capability to extend telephone and dial-up data services to enclaves of users remoted up to two (2) miles away from the DEOS. A typical configuration will consist of three RSAMs for each DEOS. Each RSAM shall be packaged separately to allow for them to be used at geographically disparate locations.

Each RSAM shall consist of the following functionality:

a. **TSM0041**-CSU/DSU – Support the extension of a DS-1 formatted signal up to two (2) miles from the DEOS. Local and distant end CSU/DSUs shall be provided.

b. **TSM0042**-Channel Bank – The channel bank shall provide a DS-1 formatted output signal. The channel bank shall support a minimum of nineteen (19) 2-wire Foreign Exchange Subscriber (FSX) Plain Old Telephone System (POTS) and a minimum of two (2) ISDN Basic Rate Interfaces (S Interface).

c. **TSM0043**-UPS – The UPS shall provide a minimum of 15 minutes (threshold), 30 minutes (objective) of reserve power to all components of the RSAM.

d. **TSM0044**-Subscriber Interface. The RSAM shall provide standard RJ-11 (POTS) and RJ-45 (ISDN) interfaces.

3.1.3.3 Deployable Integrated Transport Suite (DITS)

TSM0045-The DITS shall provide a transmission resource controller and control functions packaged in transit cases. The bandwidth management and control functions shall be capable of being operated and deployed independently of each other. The transmission resource controller shall be capable of supporting multiple trunk and port interfaces. The control function shall accept trunk interfaces from the transmission resource controller and be capable of inserting stable timing and perform encryption/decryption. The control function will typically provide an interface to a variety of transmission media via integral or standalone modems.

3.1.3.3.1 Transmission Resource Controller

d. **TSM0046**-The DITS shall contain a bandwidth management capability using a Transmission Resource Controller (TRC) mounted into a transit case. The transmission resource controller shall be the means of interconnecting and controlling secured and unsecured digital trunks between DITSs and DTCs/JECCSs as well as a limited number of channel level telephony and data equipment. The TRC shall be packaged in such a way as to not interfere with access to its physical port and trunk interfaces. The TRC network shall function in an arbitrary topology, and connectivity between any two like

ports shall be possible if there is at least one path between their respective stations. If a link in the network is severed and a path providing sufficient bandwidth is available, the TRC shall automatically re-route calls. The TRC shall also provide a demand-assigned bandwidth capability that shall dynamically allocate only the amount of bandwidth needed to support a call. Bandwidth shall be efficiently converted so that only bandwidth needed to support each call is used. The TRC shall provide a redundant processor capability to improve system reliability. The TRC shall allow transition to Asynchronous Transfer Mode (ATM) technology by the addition of modules. The TRC shall provide SNMP MIB agents or have Neuralstar 6.2 adapters (proxies) available to allow Joint Network Management System (JNMS) monitoring.

3.1.3.3.1.1 Priority

TSM0047-The network manager shall be able to assign the priority of each circuit. The TRC shall preempt lowest priority circuits when the bandwidth demand exceeds capacity.

3.1.3.3.1.2 Routing

TSM0048-When calls (voice or data) are programmed through the TRC network, the network manager shall be able to impose conditions on routing calls through the network. These conditions shall include: restricting the call to encrypted or fiber channels, and time-of-day restrictions. The network manager shall be able to reserve bandwidth on any trunk manually or by means of a programmed schedule. The TRC shall provide dynamic adaptive routing of channels. If a trunk fails, all circuits using it shall be reconnected automatically via the next best path that is available.

3.1.3.3.1.3 Alarms

TSM0049-The TRC shall send multiple levels of alarms to the operator by either an automatic or demand mode. The network manager shall be able to program the minimum level of alarm to be observed. The alarms, as a minimum, shall alert the manager of a lost trunk, a BER exceeding a programmed threshold, a recovered trunk, frame loss. The TRC shall have visual indicators showing the alarm level and, optionally, shall provide an audible alarm warning.

3.1.3.3.1.4 Events

TSM0050-The TRC shall be able to report events automatically or on demand, where events shall consist of at least circuit establishment problems, hardware module state changes, and network adjustments.

3.1.3.3.1.5 Voice Call Compression and Echo Cancellation

TSM0051-The TRC shall provide call compression methods for voice calls to reduce trunk bandwidth. Voice Call Compression shall be provided for 100% of the required T1 DS0 channels.

a. **TSM0052**-A combined compression and echo cancellation capability shall be provided for a minimum of 66% of the T1 DS0 channels. The method of compression shall be Low-Delay Code Excited Linear Prediction (LD-CELP). This call compression shall be disabled as required to support a call.

b. **TSM0053**-A compression capability shall be provided for a minimum of 33% of the T1 DS0 channels. The method of compression shall allow secure STU-III, STE (STU-III Mode), and STE (FNBDT Mode) calls to pass uncompressed in a digital format through the network. Echo cancellation capability shall be provided for these channels.

3.1.3.3.1.6 ISDN Switching

TSM0054-The TRC shall support switching of ISDN ANSI-619a T1 PRIs for all T1 PRIs. The TRC shall provide for user defined selective transmission of D-channel information in order to conserve trunk bandwidth. The entire 64kb D-channel does not have to be transmitted for each PRI.

3.1.3.3.1.7 TRC Interfaces

TSM0055-The TRC shall support a trunk rate of 8.192 Mbps and support a minimum trunk rate of 16 kbps.

3.1.3.3.1.7.1 TRC Standard Port Interfaces

TSM0056-The TRC shall be populated with the following interfaces for the port side (standard configuration):

a. Six (6) serial synchronous data interfaces capable of operating at 1.2kbps – 1344kbps with EIA-530 and Conditioned Diphase (CDP) signal interfaces
b. Four (4) serial synchronous/asynchronous data interfaces capable of operating at 75bps – 64kbps with EIA-530 signal interfaces
c. Twelve (12) serial synchronous data interfaces capable of operating at 9.6kbps – 8Mbps with an EIA-530 signal interface
d. Three (3) T1/T1 PRI interfaces
e. Four (4) Analog/Digital – Digital/Analog signaling conversion subscriber (FXS) interfaces which also provide a compression capability

These physical interfaces may be integral to the TRC, extended via an adapter cable, or may appear on the DITS Signal Entry Panel provided that they are readily accessible by the operator.

3.1.3.3.1.7.2 TRC Trunk Interfaces

TSM0057-Four (4) EIA-530 trunk interface cards shall be provided for the trunk side of the TRC. The maximum rate of any one EIA-530 trunk interface shall be capable of operating at

rates of up to at least 8.192 Mb/s. The TRC trunks shall directly interface to DTC via the Promina 800 Symmetrical Asymmetrical trunk (SA TRK) card or to the JECCS via the Promina 400 SA TRK card. One of the trunk interface cards shall be a configuration card (not installed for standard operation). The configuration card and associated cabling shall be safely stowed within the transit case when not in use.

3.1.3.3.2 DITS Technical Control Functions

TSM0058-The DITS technical control function shall provide cable and fiber modems, transmission security, timing distribution, patching, signal interface and man-machine interface capabilities.

3.1.3.3.2.1 Modems

TSM0059-A minimum of four (4) independent modems shall be provided converting NRZ to CDI unbalanced output signals interoperable with CV-2048 and MD-1026 (per ICD002), as well as to a fiber optic output interoperable with the MD-1272/G to pass data. Support for orderwire functions is not required. The modems shall provide the ability for the user to select a CDI unbalanced output (operating from 72kbps – 4.608Mbps) or a fiber optic output (operating from 72kbps – 8.192Mbps). This requirement may be accomplished using a single modem for both interfaces or separate modems that are interchangeable within the rack mount provided. The programming, maintenance or restoral ("hot swap") of any failed modem shall not affect the operation or maintenance of any remaining modems. The physical interfaces for the NRZ (DCE) side of the modem shall be brought to the patch panel in accordance with paragraph 3.1.3.3.2.4. The physical interfaces for the CDI output shall be CX-11230. The physical interface for the Fiber Optic output shall be CX-13295. These physical interfaces may be integral to the modem, extended via an adapter cable, or may appear on the DITS Signal Entry Panel provided that they are readily accessible by the operator.

The modems shall support the following timing capabilities:

e. Port: reference timing to DTE Terminal Timing
f. Network: reference timing to Receive Timing
g. Internal: reference timing to an internal oscillator
h. External: reference timing to an external Clock Input

3.1.3.3.2.2 Transmission Security

TSM0060-Transmission security will be provided by Trunk Encryption Devices (TEDs). A minimum of four (4) TEDs, i.e. KIV-19s, shall be rack mounted to provide encryption for multi-channel multiplexed trunks, as needed for TRANSEC connectivity. Three of the TEDs will be used to provide security for the TRC trunks. The remaining TED shall be user-selectable via the patch panel as an on-line spare. Automatic control of each TED resynchronization by the Transmission Resource Controller shall be provided as necessary. A TED phase select capability shall be provided on the DITS SEP. This phase select capability will provide for normal or inverted clock. TEDs will be provided as GFM.

TSM0061-Rack layout and design shall take the heat dissipation of the KIV-19 into consideration.

3.1.3.3.2.3 Timing Distribution

TSM0062-The DITS shall provide a timing distribution capability. Primary (or master) timing shall be provided by a high stability Rubidium reference disciplined by Global Position System (GPS). The GPS receiver shall be Selective Availability with Anti-Spoofing Mode (SAASM) compliant with a P(Y) code capability provided per DoD GPS Security Policy, March 29, 1999. The timing distribution system shall provide station clock outputs rates that are compatible with the external clock requirements of the DITS technical control equipment. During acquisition or in case of loss of the GPS source, the Primary timing reference shall have an accuracy of at least $\pm 3 \times 10^{-11}$ and a frequency stability of 1×10^{-11} per month. This timing source shall provide multiple independent balanced clock outputs required for all components requiring a stable timing source, including at a minimum, the TRC and the Trunk Encryption Devices (TEDs). In case of loss of the entire timing system within the DITS, the TRC and the TEDs shall have the capability to slave timing from an incoming trunk/group from the DTC, the JECCS or another DITS. An alarm function shall be provided to alert the operator when the GPS is lost. In addition, a GPS antenna shall be provided with a minimum 50' cable. Appropriate lightning protection shall be provided for the antenna connection.

3.1.3.3.2.4 Patching Requirements

TSM0063-A manual means of signal patching shall be provided for interconnectivity of TRC trunks, all TED unencrypted (plain text) and encrypted (cipher text) interfaces, timing distribution interfaces, and modem equipment (DTE) interfaces. A means for testing shall be included that allows access to all circuits in both directions for break and monitor conditions.

TSM0064-RED/BLACK isolation in accordance with NTISSAM TEMPEST/2-95 (12 Dec 95) shall be provided for the patch panels. The patch panel shall be organized where unencrypted and encrypted signals are separated to the maximum extent possible. Separate keyed patch jacks are not required. Patch panels shall utilize sub-twinax connectorization patch jacks.

TSM0065-Normal-through twin-axial patch jacks shall be utilized to the maximum extent possible to reduce the need for patch cords. Patch panel layout and wiring shall provide for DTE interfaces to be normal through connected to DCE interfaces. Patch cords shall be provided to patch a minimum of 20% of the patch appearances simultaneously. Looping plugs with test points shall be provided to allow testing/loopback of a minimum of 10% of the patch appearances simultaneously.

a. The TRC trunk interfaces (DTE) shall be normal through to the TED unencrypted (plain text – DCE) interfaces. Provisions shall be made for a fourth TRC trunk interface appearance on the normal through patch panel.
b. The TED Red Station Clock (RSC) shall be normal through to the TRC trunk Send Timing (ST) interface.

c. The TED Resync interface (Red Signal) shall be normal through to the TRC trunk Request To Send (RTS) interface.
d. The TED encrypted (cipher text – DTE) interface shall be normal through to the modem (DCE) interface.
e. Timing distribution clock outputs shall be normal through to the TED Black Station Clock (BSC) interface and to the TRC to provide a port timing interface.

TSM0066-A patch appearance shall be provided for each modem's Send Timing (ST) interface to allow alternative timing to the TED BSC interface in the event of a timing distribution system failure. Patch appearances shall be provided for two general-purpose modem DCE interfaces.

3.1.3.3.2.5 DITS Signal/Power Entry Panel

TSM0067-Signal entrance panel(s) (SEPs) shall provide the user with the capability of terminating external interfaces. Quick disconnect tactical interfaces, i.e., CX-11230, Tactical Fiber Optics connections, shall be provided on the SEPs for signal/group lines that interconnect function(s) and/or provide modular expansion of different function(s). Lightning and EMP protection shall be provided on all SEP interfaces. The SEP shall provide a ground terminal lug. Signal cable shields, e.g., CX-11230, shall be connected internally to the SEP ground terminal lug. Each interface on the SEP shall be identified with metal labels that are secured with rivets. The DITS shall contain a signal entrance panel that provides appearances for the following at a minimum:

a. 4 TRC Trunk Interfaces (DTE)
b. 2 Timing Distribution Interfaces (DTE)
c. 2 General Purpose Modem DCE Interfaces
d. 4 TED Phase Select Switches
e. Modem DCE Interfaces, if required in accordance with paragraph 3.1.3.3.2.1

TSM0068-Cabling and connections on the SEP shall be configured to minimize the number of cables and set-up time required to connect the DITS to external interfaces (e.g., DEOS). All interface connections shall have weatherproof captive covers. The SEP shall have bridal rings for strain relief of tactical field wiring.

3.1.3.3.2.6 DITS Man-Machine Interface

TSM0069-One administration workstation shall be provided. The DITS shall provide a configuration capability to allow an operator to locally or remotely configure and/or control the TRC. Remote configuration shall include access via IP network and dedicated dial-up modem access. Dedicated communication channels and dial-up capability shall be provided to support TRC management access. Dial-up modem port connection shall not be additive to the port requirement in TSM0020. The administration workstation shall be selected from the current USMC Marine Corps Common Hardware Suite of equipment. At a minimum the workstation

shall be configured with the following software versions (or later): Microsoft Windows 2000 and Microsoft Office 2000 (GFM). Additionally, the administration workstation shall be capable of running the TSM Electronic Technical Manual(s).

3.1.3.3.2.7 DITS Uninterruptible Power Supply

TSM0070-The DITS shall be provided with an UPS that provides for 15 minutes (threshold)/30 minutes (objective) of reserve power to all components.

3.1.3.4 TSM Objective Capabilities

TSM0071-The following capabilities are design objectives for the TSM. TSM Threshold design shall not preclude future upgrades to incorporate any objective capabilities not yet inherent in the TSM. TSM objective capabilities are in addition to, not a replacement for, TSM threshold requirements. It is the Government's intent to pursue technology insertion throughout the life of the TSM program. Emerging technologies including, but not limited to, those delineated below will be inserted into the TSM program when the Government determines they have sufficiently matured.

3.1.3.4.1 Voice Over Internet Protocol (VoIP)

TSM0072-A voice to internet protocol data gateway and a call processing capability shall be provided. The gateway shall be capable of connecting an IP telephony network to the CS. The gateway shall support an auto-sensing 10/100 Ethernet port. The gateway shall convert both analog and digital voice to IP packets using standard coders/decoders including, at a minimum, G.711, G.723.1, G.728, and G.729a. The call processing capability shall be able to extend enterprise telephony features and functions to packet telephony network devices. The VoIP solution shall be implemented using the draft DSN Packet Voice Processing/Transport Implementation and Business Case Guidance (Nov 2002).

3.1.3.4.2 Wireless Telephony

TSM0073-An objective capability shall be provided to connect a GSM/802.11b wireless system to the DEOS. The wireless system shall support a minimum of twelve Type 1 secure portable devices over a variety of networks both in CONUS and OCONUS. Any GSM solution shall support the three GSM frequency bands. International power output limitations and frequency restrictions shall be considered in system design.

3.2. System Characteristics

TSM0074-The TSM shall be implemented incorporating all threshold functions at a minimum. A modular approach shall be employed in the TSM DEOS and DITS functions. The DEOS and DITS shall be designed such that they can operate in conjunction with each other or separately. There shall be no unique cabling between and DEOS and DITS. Readily available commercial

or type classified military cable shall be used to connect the DEOS and DITS to the maximum extent possible.

3.2.1 Not Used

3.2.2 Operational State

TSM0075-All equipment within a TSM shall be set up for operation locally. The encryption devices of the security function shall be initialized and/or keyed through a key management scheme appropriate to the device being used.

3.2.3 Storage and Transport State

TSM0076-In this state, the TSM equipment shall be configured for shipment, transport or storage. All TSM equipment shall be transported within transit and storage cases.

3.2.4 Not Used

3.2.5 Physical Characteristics

3.2.5.1 Transportation & Storage

3.2.5.1.1 Transport

TSM0077-The TSM system shall be storable and transportable without damage or degradation. Deployable TSM components shall be configured to be transportable via standard military air and standard military and commercial, land, rail, and sea modes.

The TSM System in the transport and storage mode shall be transportable as secured cargo by:

a. **TSM0078**-fixed and rotary wing aircraft,
b. **TSM0079**-road vehicles over cross-country terrain,
c. **TSM0080**-rail, landing craft and sealift.

TSM0081-The equipment shall be packaged to permit on and off loading in all of the transport modes without the need for special equipment.

3.2.5.1.2 Storage

TSM0082-The system shall not incur damage when stored without power, heat, and air conditioning for a period of 30 days, subject to the environmental conditions contained in this purchase description. Batteries shall be easily accessible so they may be removed for separate storage or for testing, replacement, and recharging. Any special considerations for long term storage (up to 1 year) shall be identified.

3.2.5.2 Transit Case Requirements

TSM0083-The TSM system transit cases shall provide protection for TSM equipment during storage and transport.

TSM0084-The TSM system components and other ancillary equipment deployed in transit cases shall be operable from within the transit cases, via front and rear removable covers.

3.2.5.2.1 Cooling

TSM0085-Transit cases and equipment placement shall provide adequate cooling and/or ventilation (e.g., fans) to protect the system components from overheating during operation.

3.2.5.2.2 COMSEC/TRANSEC

TSM0086-Transit cases that contain encryption equipment shall be labeled as a COMSEC configuration item.

TSM0087-Cases containing Communications Security (COMSEC)/Controlled Cryptographic Item (CCI) shall be lockable using a combination padlock. Padlocks shall be provided for any transit case that requires them.

3.2.5.2.3 Weight

TSM0088-The weight of each populated TSM System transit case, when configured for transport, shall not exceed 174 pounds **or** exceed the two-man, 3 –foot lift requirements of MIL-STD –1472, paragraph 5.9.11.3 for guidance. Handles and grasp requirements shall use the guidance of MIL-STD-1472, paragraph 5.9.11.5.

3.2.5.2.4 Dimensions

TSM0089-All transit cases shall fit through ship's hatches of 66 inches by 26 inches. Handles shall be located to permit the transit cases to be carried through ship's hatches.

3.2.5.2.5 Construction

TSM0090-Transit cases shall be constructed so that a water-tight seal is maintained by removable covers. Transit cases shall have low profile, nesting-type feet for stacking purposes, both top and bottom. External latches shall be provided for latching cases for storage purposes. Transit cases shall be provided with a pressure relief valve. The construction and mounting of the TSM system components in the transit cases shall provide ready access to all displays, indicators, mechanisms, and controls required for system operation. The center of gravity for each case shall be centrally located but below the center of case vertically.

3.2.5.2.6 Rack Mount

TSM0091-All rack-mountable TSM equipment shall be installed in EIA-standard 19-inch (48.26 centimeters) electronic equipment rack(s) in accordance with EIA-RS-310-D.

3.2.5.2.7 Paint and Finish

a. **TSM0092**-All exterior surfaces of the transit cases shall be green, color 34094, in accordance with FED-STD-595B.
b. **TSM0093**-All exterior surfaces shall be able to be stenciled in accordance with A-A-56032.
c. **TSM0094**-The external portion of the transit cases shall be capable of decontamination using Marine Corps standard Nuclear, Biological, and Chemical (NBC) decontamination procedures and equipment. MIL-HDBK-783 and MIL-STD-810F, Test Method 504 may be used as guidance on contamination avoidance and decontamination procedures.
d. **TSM0095**-The internal portion of the transit cases shall allow the use of non-corrosive decontaminates wiped on the outside portions of individual components. MIL-HDBK-783 may be used as guidance.

3.2.5.2.8 Power Cables

a. **TSM0096**-Power cable assemblies and connectors shall be keyed to prevent improper connection.
b. **TSM0097**-A 25-foot power cable(s) shall be provided for connection of the UPS to the power source.
c. **TSM0098**-A 10-foot power cable with National Electrical Manufacturers Association (NEMA) 5-15 connector shall be provided with each case requiring power to the UPS if housed separately.

3.2.5.2.9 Transit Case Wiring

a. **TSM0099**-All interconnecting wiring for all components and accessories shall be contained in the cases with mounting devices (i.e., wire ties, aluminum cable mounts).
b. **TSM0100**-All access areas shall be free of any wiring.
c. **TSM0101**-Cabling between all components within the case(s) and the signal entry panel (SEPs) shall be provided with mating connectors.
d. **TSM0102**-SEPs shall have bridal rings for strain relief of tactical wiring.
e. **TSM0103**-All connectors exposed to the weather shall have captive waterproof covers.
f. **TSM0104**-Cable strain relief and service loops shall be provided for rack-mounted equipment to:
    1) permit operation of equipment in the fully extended position
    2) enable removal/replacement of equipment for maintenance

3.2.5.3 Electrical and Power Requirements

3.2.5.3.1 Normal Power

TSM0105-The TSM System shall operate on standard, nominal commercial power: 120 VAC, single phase, 3-wire, 50/60 Hertz (Hz), plus or minus 10 percent for voltage and plus or minus 5 percent for frequency. The TSM system shall operate on commercial power or current and future USMC mobile tactical generators found in the inventory (208 VAC, 3 Phase, 50/60 Hz). The system will be designed to accept power via an existing camp power grid as part of a Mobile Electronic Power Distribution System (MEPDIS).

3.2.5.3.2 Uninterruptible Power

TSM0106-The TSM System shall provide power conditioning and continuation equipment such as Uninterruptible Power Supplies (UPS). An UPS is used for orderly shutdown of mission critical equipment if power is lost and shall provide a minimum of 15 minutes (threshold) and 30 minutes (objective) of power for equipment shutdown. The system shall automatically notify operators when a switch to UPS power occurs.

3.2.6 System Quality Factors

3.2.6.1 Reliability

TSM0107-The DEOS shall have a Mean Time Between Failure (MTBF) of 720 hours.

TSM0108-The DITS shall have an MTBF of 720 hours.

TSM0109-The RSAM shall have an MTBF of 720 hours.

3.2.6.2 Maintainability

3.2.6.2.1 Organizational Level Mean Time To Repair

TSM0110-The TSM organizational level Mean Time To Repair (MTTR) shall not exceed 60 minutes for any component in the TSM.

3.2.6.2.2 Intermediate Level Mean Time To Repair

TSM0111-The TSM Intermediate MTTR shall not exceed 90 minutes for any component in the TSM.

3.2.6.2.3 Mean Time to Perform Preventive Maintenance

TSM0112-The Mean Time To Perform Preventive Maintenance shall not exceed 30 minutes for the TSM.

3.2.7 Environmental Conditions

TSM0113-The TSM system shall be employed worldwide and will be exposed to all types of weather conditions: hot and dry deserts, hot and humid tropics, and cold polar environments. The TSM shall have the capability to deploy within as well as outside CONUS. The TSM shall be capable of operation, storage, and transport in a wide variety of environmental conditions. In the operating mode, TSM equipment such as voice switches, data switches, etc., will be located in user provided facilities (i.e. buildings, shelters, tents, etc.) that may or may not be environmentally controlled. The TSM equipment shall meet all the performance requirements cited within this purchase description under the environmental conditions specified and shall suffer no physical damage, failure, deterioration, or change in tolerance limits which could in any manner prevent it from meeting the operational service or maintenance requirements. Unless otherwise specified, these requirements will apply to the operational and storage/transport modes and shall include the packaging, as well as all equipment inside.

3.2.7.1 Altitude

TSM0114-The TSM shall not be damaged when transported between 100 feet Below Mean Sea Level (BMSL) and 40,000 feet Above Mean Sea Level (AMSL) at rates of altitude change up to 2000 feet/minute. The TSM, in its operational configuration, shall meet full performance requirements while being operated at elevations from 100 feet BMSL to 10,000 feet AMSL.

3.2.7.2 Temperature

TSM0115-The TSM shall operate normally in temperatures from 0 to 40 degrees C (+32 to +104 degrees F). The system shall withstand storage and transportation in temperature extremes from –30 to +50 degrees C (-22 to 122 degrees F).

3.2.7.3 Humidity

TSM0116-In the operating mode, The TSM equipment shall operate when exposed to relative humidity up to 95% non-condensing. In the storage/transport, the TSM shall withstand exposure to relative humidity up to 95%, including condensation.

3.2.7.4 Sand and Dust

TSM0117-The TSM shall, in its operational configuration, withstand exposure to settling dust and shall sustain no dust penetration that affects operational service requirements. The TSM shall, in its transport configuration, withstand exposure to blowing sand (15 mph in any direction) and shall sustain no dust penetration that affects operational service requirements. Use of filters is acceptable.

3.2.7.5 Salt Fog

TSM0118-The TSM shall, in storage and transport conditions, withstand exposure to a salt fog environment for up to 2 hours.

3.2.7.6 Fungus

TSM0119-The TSM shall provide no nutrients in material, coating or production residuals that support fungal growth. MIL-HDBK-454A, Guideline 4, Table 4-1 and MIL-STD-810F, Test Method 508.5-1 may be used as guidance on fungal growth conditions and nutrients.

3.2.7.7 Shock and Vibration

TSM0120-The TSM shall withstand the shock and vibrations associated with tactical and transportation requirements such as transport by HMMWV over improved highways and unpaved roads at speeds of 55 mph, and over cross country terrain at speeds of 15 mph.

3.2.7.8 Ice and Snow

TSM0121-TSM, in its stored configuration, shall withstand a snow load of 40 pounds per square foot on any surface.

3.2.7.9 Acoustic Noise

TSM0122-Any element of the TSM system shall operate at an acoustic noise level not to exceed 65 dB(a). The acoustic noise level during temporary noise conditions such as equipment alarms and printing shall not be considered as part of the normal operational state.

3.2.7.10 Rain

TSM0123-The TSM system transit cases shall be watertight in the transport mode. The TSM will not be required to operate while immersed or standing unprotected in precipitation.

3.2.7.11 Lightning

a. **TSM0124**- The TSM, in its operational configuration, shall contain protection devices sufficient to protect personnel and equipment from lightning induced threats.
b. **TSM0125**-The TSM shall be capable of withstanding surge currents due to direct strikes on external cables or a triggering structure other than the TSM. The direct strike characteristics are a maximum current of 20 kA reached within 1.0 microseconds and decaying to one-half of the peak amplitude within 40 microseconds. It is expected that external cables will be damaged by direct strikes, but no other TSM equipment shall be damaged.

c. **TSM0126**-The TSM power input leads shall be capable of withstanding an indirect lightning strike. It can be assumed that the indirect strike is no closer than 262 feet (80 meters), with a maximum current of 12 kilo amperes (KA) reached within 8.0 microseconds and decaying to one-half of the peak amplitude within 10 microseconds.

d. **TSM0127**-All wireline circuits terminating on the DEOS and DITS shall be provided external primary lightning protection. The external lightning protection shall be at least 15 wireline feet away from the DEOS and DITS SEPs.

e. **TSM0128**-Lightning protection devices and safety procedures shall be incorporated into training material and technical manuals.

f. **TSM0129**-Deleted

g. **TSM0130**-Deleted.

3.2.8 Deployment Requirements

TSM0131-The TSM shall be deployable by a two-man crew. No special tools or heavy lift devices shall be required.

3.2.8.1 Setup

a. **TSM0132**-The TSM Regimental Configuration (one DEOS, three RSAMs and one DITS) shall be set-up from the transport state to the operational state and ready to accept power within 30 minutes when performed under normal conditions. Once power has been applied, local phone services shall be provided in no more than 1 hour.

b. **TSM0133**-The TSM Regimental Configuration (one DEOS, three RSAMs and one DITS) shall be set-up from the transport state to the operational state and ready to accept power within 60 minutes when performed in Mission Oriented Protective Posture (MOPP) protective clothing (up to level IV) or cold weather clothing.

3.2.8.2 Teardown

a. **TSM0134**-The TSM Regimental Configuration (one DEOS, three RSAMs and one DITS) shall be disassembled from the operational state to the transport state (including shut-down of the system) within 30 minutes when performed under normal conditions.

b. **TSM0135**-The TSM Regimental Configuration (one DEOS, three RSAMs and one DITS) shall be disassembled from the operational state to the transport state (including shut-down of the system) within 60 minutes when performed in MOPP protective clothing (up to level IV) or cold weather clothing.

3.3 Design and Construction

TSM0136-The contractor shall maintain quality assurance standards in design, construction, and workmanship that maximize the operational capability and effective life of the equipment and prevent injury or harm to personnel.

3.3.1 Material, Parts, and Processes

TSM0137-The contractor shall ensure that selected parts enable the system to meet or exceed its reliability and environmental requirements. The contractor shall use materials and processes that are common in manufacturing and based on nationally or internationally recognized standards.

3.3.1.1 Connectors

TSM0138-In order to prevent incorrect assembly that may cause damage, connectors shall be:

a. keyed
b. marked

3.3.1.2 Fastener Hardware

TSM0139-Equipment to be assembled or disassembled in the field shall be secured with corrosion-resistant captive hardware. Small hardware (bolts, washers, nuts, etc.) shall be captive wherever practical.

3.3.1.3 Tolerances

TSM0140-The design, selection, and fabrication of all selected components and LRUs shall be such that the cumulative effect of manufacturing tolerances, deflections and distortions due to repeated assembly and disassembly, operating environments, and other conditions specified herein, shall not prevent the performance requirements from being met. The tolerance requirements shall be met without the need for adjustments or special procedures.

3.3.1.4 Corrosion Control

TSM0141-All external parts and materials subject to corrosion shall be coated with anti-corrosion compounds.

3.3.1.5 Equipment Electrical Grounding Scheme

TSM0142-The TSM equipment grounds shall be electrically connected to a locally available earth grounding point in accordance with National Fire Protection Association (NFPA) 70 and MIL-HDBK-419A.

3.3.1.6 Transit Case Electrical Grounding Scheme

TSM0143-All SEPs shall have a ground terminal lug. All PEPs shall have a ground terminal lug. Signal cable shields shall be connected internally to the SEP ground terminal lug. All equipment inside a transit case shall have power grounds bussed internally to the PEP ground terminal lug. A 10' braided ground strap shall be provided with each DEOS transit case and with each DITS transit case.

3.3.1.7 Electrostatic Discharge

TSM0144-Electrostatic Discharge (ESD) protection shall be provided for ESD sensitive items (i.e., integrated circuits (ICs), semiconductor devices, circuit cards, and electronic equipment). ESD sensitive items shall have ESD warning labels affixed to protective packaging and equipment.

3.3.2 Electromagnetic Interference / Electromagnetic Compatibility

TSM0145-Individual TSM components shall, as a minimum, comply with electrical emission limits for computing devices pursuant to the appropriate sections of Part 15 of Federal Communications Commission (FCC) Rules for Class A operation.

TSM0146-The TSM shall not cause Electromagnetic Interference (EMI) with other C4I systems. To control the electrical emissions and susceptibility characteristics of the TSM, the installation of its subsystems and associated interfaces shall conform with the following MIL-STD-461D performance requirements for Ground-based installation: CE102, CS101, CS114, CS115, CS116, RE102, RS103.

3.3.3 Identification and Marking

TSM0147-The contractor shall identify manufactured and assembled items with markings and/or nameplates that remain legible for the life of the item, remain attached for the life of the item, and are visible during normal operational use.

3.3.3.1 Nameplates and Product Marking

a. **TSM0148**-The TSM shall have a nameplate on each transit case detailing the following:
    1. nomenclature
    2. configuration item identification
    3. model number
    4. serial number
    5. stock number (NSN)
    6. manufacturer identification
    7. contract number
    8. technical manual number
    9. paint characteristics
    10. weight
    11. center of gravity location

12. case orientation for all transit case covers (front, back, top)
13. case number of total cases

b. **TSM0149**-A nameplate shall be affixed to each component with the following information:

1. nomenclature
2. configuration item identification
3. model number
4. NSN
5. manufacturer identification
6. contract number
7. technical manual number
8. serial number

c. **TSM0150**-Warranted items shall be identified by serial number or barcode labeling (as required) to the LRU. This means of equipment identification will be entered into the Warranty Management system to ensure the traceability of TSM warranted items.

d. **TSM0151**-Nameplates shall be located such that they are visible during normal operational use.

e. **TSM0152**-All nameplates and markings shall be legible and permanent.

f. **TSM0153**-All nameplates shall be capable of withstanding the environmental tests specified for the system.

g. **TSM0154**-All nameplates shall be capable of withstanding the cleaning procedures specified for the system.

h. **TSM0155**-Classified items shall be marked in a conspicuous manner to provide notice that the item(s) are subject to security restrictions.

i. **TSM0156**-Foil nameplates shall not be used.

j. **TSM0157**-Cables shall bear a unique identification permanently affixed to cables near each connector that signifies the equipment/assembly with plug/jack they interconnect. The cable label at the end of the cable, at a minimum shall have the following information: ref-des, W number, cable part number, and cage number.

k. **TSM0158**-Nameplates that identify the purpose of a connection shall be provided near each connector on all:

1. SEPs

2. PEPs
3. Patch Panels

3.3.4 Workmanship

TSM0159-Workmanship shall conform to best commercial practices.

3.3.5 Interchangeability

TSM0160-LRUs and CCAs of one TSM System shall be interchangeable by form, fit, and function with the corresponding LRU and CCA of any other TSM System.

3.3.6 Safety

3.3.6.1 Electrical Design

TSM0161-The system shall comply with best commercial practices and standards, to include NFPA 70 (National Electrical Code) for the electrical design of system components. The system shall not present uncontrolled hazards during operation, maintenance, or disposal of equipment.

3.3.6.2 Radio Frequency and X-radiation Safety

TSM0162-Equipment emitting RF radiation (including antennas) shall be shielded, located or operated as to avoid exposing personnel to hazards.

3.3.6.3 Equipment Safety

TSM0163-The design shall include the following provisions:

a. **TSM0164**-Equipment weighing greater than 37 pounds shall contain a warning label informing personnel of the exact weight and the recommended number of personnel required for safe lifting, using the guidelines of MIL-STD-1472D, Table XXIII. Design Weight Limits. Warning labels shall be in accordance with 29 CFR 1910 Occupational Safety and Health Standards for Safety labeling.

b. **TSM0165**-The equipment design shall have all exposed edges and corners rounded to prevent cuts or punctures. The design shall minimize the chances of pinching and crushing hazards.

c. **TSM0166**-Fiber-optic interfaces shall meet the safety design requirements of ANSI Z136.2.

3.3.6.4 Chemical Safety

TSM0167-The design shall include the following provisions:

a. **TSM0168**-Battery enclosures shall be of such construction that in the event of battery venting, electrolyte will not be expelled in either liquid or droplet form.

b. **TSM0169**-If a battery is used which releases explosive gases (i.e., hydrogen), the battery box design shall be such that it insures no leakage of the gas into the main equipment or into other sources of ignition. Battery box venting shall be provided to minimize the explosive gas concentration in the battery box.

c. **TSM0170**-Materials of components which may produce toxic effects during any phase of the system life cycle or treatment substances listed in the Toxic Substance List (published by National Institute of Occupational Safety and Health (NIOSH)) that are proposed for use, shall first be evaluated to determine if a less hazardous and viable alternative exists. If the item is still to be used, all personnel exposures to the substance will be less than the Lowest Published Toxic Dose and Lowest Published Toxic Concentration as published in the NIOSH Registry. Where the Registry specified unacceptable level of exposure based upon industrial standards, such level of exposure should be used as the qualifying acceptable amount. In the event that the Dose and Concentrations listed the Registry is less than the acceptable level of exposure based upon industrial standards, the lesser of the two amounts should be used as the qualifying acceptable amount. Where a Threshold Limit Value (TLV) is published in the Registry for a specific substance, then under no conditions should personnel exposure exceed the TLV.

d. **TSM0171**-The system shall not contain items which are comprised of or require the use of Class I Ozone Depleting Substances following delivery to the Government.

3.3.7 Human Engineering

TSM0172-The TSM shall be designed using MIL-STD-1472, Human Engineering Design Criteria for Military Systems, Equipment, and Facilities, and MIL-STD-1474, Noise Limits for Military Material as a guide.

3.3.8 Nuclear, Biological, and Chemical (NBC) Survivability

a. **TSM0173**-The TSM system shall be capable of operating in both chemically and biologically active environments. MIL-HDBK-783 and MIL-STD-810F, Test Method 504 may be used as guidance on contamination avoidance and decontamination procedures.

b. **TSM0174**-The TSM system and components shall be capable of operation and maintenance by personnel wearing full NBC contaminant protective clothing (MOPP IV level).

4.0 VERIFICATION.

A test and evaluation program shall be established for the TSM that encompasses hardware, software, and system-level tests and inspections. The objective of the program shall be to verify that the TSM meets all design, functional, and physical requirements of Section 3 of this specification.

4.1 System Definition

TSM0001-This requirement shall be verified by examination.
TSM0002-This requirement shall be verified by demonstration.
TSM0003-This requirement shall be verified by demonstration.
TSM0004-This requirement shall be verified by demonstration.

4.1.1. Mission, Threat and Interoperability
N/A

4.1.1.1 Mission
N/A

4.1.1.2 Threat
N/A

4.1.1.3 MAGTF Communications Architecture
N/A

4.1.1.3.1 Layered View
N/A

4.1.1.3.2 Network Topology
N/A

4.1.1.3.3 Current Digital Backbone
N/A

4.1.1.3.4 Planned Digital Backbone
N/A

4.1.2 Interoperability
N/A

4.1.2.1 DEOS and DITS Interfaces

TSM0005-This requirement shall be verified by test.

4.1.2.2 DEOS and DITS Connectivity

TSM0006- This requirement shall be verified by test.

4.1.3 TSM System Functions

TSM0007-This requirement shall be verified by analysis.
TSM0008-This requirement shall be verified by analysis.
TSM0008-This requirement shall be verified by analysis.
TSM0009-This requirement shall be verified by examination.

4.1.3.1 DEOS

TSM0010-This requirement shall be verified by analysis.
TSM0011-This requirement shall be verified by examination.

4.1.3.1.1 Circuit Switching Function

TSM0012-This requirement shall be verified by analysis.
TSM0013-This requirement shall be verified by examination.
TSM0014-This requirement shall be verified by demonstration.
TSM0015-This requirement shall be verified by demonstration.
TSM0016-This requirement shall be verified by analysis.
TSM0017-This requirement shall be verified by analysis.
TSM0018-This requirement shall be verified by demonstration.
TSM0019-This requirement shall be verified by analysis.

4.1.3.1.1.1 Circuit Switch Interfaces

4.1.3.1.1.1.1 Circuit Switch Standard Interfaces

TSM0020- This requirement shall be verified by examination.

4.1.3.1.1.1.2 Commercial Circuit Switch Configuration Interfaces

TSM0021-This requirement shall be verified by examination.
TSM0022-This requirement shall be verified by demonstration.

4.1.3.1.1.1.3 Circuit Switch Features

TSM0023-This requirement shall be verified by test.